EFFECT OF FUROSTANOL GLYCOSIDE TREATMENTS IN PLANT MATERIAL PRODUCTION IN CURRANTS (*Ribes sp.)*

EFECTUL TRATAMENTELOR CU FUROSTANOL GLICOZIDE ÎN PROCESUL DE PRODUCERE A MATERIALULUI SĂDITOR LA COACĂZ (*Ribes sp*.)

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Abstract. *The influence of treatment with two furostanol glycosides (G1 and G2) on the rooting process and shoot development of cuttingswas analysed relative with a usual commercial rooting product (RADI-STIM) at three currants cultivars (Deea, Abanos and Ronix). Although both glycosides treatments induced a better rooting than RADI-STIM, G2 treatment induced higher number of roots and a stronger development of root system (with more and longer roots) while G1 treatment had a higher influence on foliar apparatus growth and development.*
Key words: furostanol glycoside, biostimulators, rooting, currants, vegetative growth

Rezumat.*Influența tratamentelor cu două glicozde furostanolice (G1 şi G2) asupra înrădăcinării şi a dezvoltării aparatului foliar a fost studiată comparativ cu influența unu iprodus comercial (RADI-STIM) la treisoiuri de coacăz (Deea, Abanos şi Ronix). Deşi tratamentul cu ambele glicozide a stimulat înrădăcinarea într-o măsură mai mare decât RADI-STIM, tratamentul cu G2 a determinat formarea unui sistem radicular mai puternic (cu rădăcini mai multe şi mai lungi) decât RADI-STIM, în timp ce tratamentele cu G1 au influențat într-o mai mare măsură creşterea şi dezvoltarea aparatului foliar.*
Cuvinte cheie: glicozide furostanolice, biostimulatori, înrădăcinare, coacăz, creşteri vegetative.

INTRODUCTION

A key step in vegetative propagation is adventitious root formation and high losses can occur because of the poor quality of the root system (De Klerk et al., 1999). Often growth regulators are used for improving cuttings rooting or its uniformity. Indole-3-butyric acid (IBA) is the primary root hormone which promotes the induction of adventitious roots, being in many cases more efficiently than IAA (Indole-acetic- acid) (Epstein and Ludwig-Müller, 1993) due to its higher stability (Nordström et al., 1991). Beside that there are many others products which can be used to improve cuttings rooting.

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In the last decade, a number of products referred to generically as biostimulant shave appeared on the market (Boehme et al. 2005). Some of them has been show to increase root and leaf growth, (Ertani et al. 2009), nutrient uptake (Eşítken and Pirlak 2002), chlorophyll content (Neri et al. 2002) and enhance resistance to biotic and abiotic stress (Boehme et al., 2008, Botta et al. 2009, Marfà et al. 2009) helping plants to cope with pest and diseases (Washington et al. 1999, Prokkola et al. 2003).

Furostanol glycosides are a new class of natural compounds which can act like bioactive compound shaving a wide range of biological activities: antioxidant, fungicidal, antiviral, bactericidal, nematocidal etc. (Vasil'eva et al., 2005). The adaptive effect of furostanol glycosides was first discovered at tomatoes and cucumbers affected by the gull nematode (Vasil'eva et al., 2000). Subsequently their influence on antioxidant enzymes (Volkova et al., 2007), assimilator pigments biosynthesis (Vasil'eva et al., 2005) and grapevines plants growth and development (Munteanu et al., 2008) has been studied.

Our experiments were focused on furostanol glycoside effect on rooting process and the furtherer growth and development of rooted cuttings of three currant cultivars.

MATERIAL AND METHOD

The experiments were carried out in UASVM greenhouse during November 2011- January 2012. Currants cuttings from Deea, Abanos and Ronixcultivarswere cut at the end of vegetation period (November 2011).

Treatment variants were represented by untreated cuttings (Control), cuttings treated with a commercial rooting product (RADI-STIM), and treated with glycoside 1 (G1) and glycoside 2 (G2) solution in different concentrations: 3mM (V1), 0.3mM (V2) and0.03mM (V3). G1 is an alcoholic extract from tomato seeds while G2 was obtained by alcoholic extraction of *Digitalis sp.*leaves.

RADI-STIM treatments were made by dipping of cuttings in RADI-STIM solution 2% for 2-3 seconds, and glycoside treatments were made by maintaining the cuttings in glycoside solution for 1 hour. Control was maintained for the same period in distillate water.

After treatment cuttings were put for rooting in perlite assuring the necessaries temperature (22-25^{0}C) and humidity (80-90%)conditions. After one month the effect of treatments on rooting process has been determined by quantification of rooting percentage of cuttings, roots number/cutting and the roots mean length.

In the second part experiment was conducted only for control plants and the best glycoside concentration treatment (0.3mM). Hence, after rooting, the cuttings were planted in pots with soil/peat3:1 (v/v) mixture and maintained in greenhouse for two months while the treatment with G1 and G2 were carried on by foliar spraying weekly. Control plants were sprayed with distillate water.

The influence of the glycoside treatments on vegetative growth was determined by the shoots length, leaves number/cutting and leaf area determination.

Leaf area measurements were made by scanning the leaves and the images were analysed with ImageJ software at 300 dpi resolution.

RESULTS AND DISCUSSIONS

Rooting percentage varied in a range of 66-81% relative with cultivar and treatment variant. In Ronix and Abanos both furostanol glycoside treatments and RADI-STIM leaded to an increasing of rooting percentage with 15-20%, and only with 10% in Deea cultivar (Tab. 1), withno significant differences between the usual commercial product (RADI-STIM) and furostanol glycoside treatments. However, the highest values of the rooting percentage were recorded on G2 treated variants, especially at the 0.3mM concentration.

Table 1

Influence of furostanol glycoside treatments on rooting process(Mean±SE; n = 10)

Treatment variant	Cultivar	Rooting %	Roots number/cutting	Roots mean length (cm)
Untreated	DEEA	66,40±*0,72*	8,34±*0,04*	6,74±*0,11*
	ABANOS	68,72±*1,09*	12,06±*0,03*	6,83±*0,08*
	RONIX	67,56±0,91	10,20±0,04	6,78±0,09
RADI-STIM	DEEA	70,57±*0,81*	9,13±*0,04*	6,78±*0,12*
	ABANOS	75,41±*0,70*	12,64±*0,06*	7,74±*0,09*
	RONIX	75,49±0,75	9,78±0,05	7,29±0,11
G1V1	DEEA	72,70±*1,13*	9,33±*0,03*	6,67±*0,13*
	ABANOS	73,31±*0,71*	12,96±*0,03*	8,56±*0,09*
	RONIX	74,00±0,92	10,34±0,03	7,48±0,11
G1V2	DEEA	73,81±*0,07*	11,35±*0,11*	7,65±*0,16*
	ABANOS	81,43±*0,22*	14,62±*0,04*	8,86±*0,05*
	RONIX	79,12±0,14	11,04±0,07	8,48±0,11
G1V3	DEEA	71,77±*0,83*	10,19±*0,03*	7,37±*0,20*
	ABANOS	71,78±*0,71*	13,92±*0,05*	8,52±*0,14*
	RONIX	73,78±0,77	10,75±0,04	8,54±0,17
G2V1	DEEA	72,51±*0,84*	9,73±*0,04*	6,59±*0,20*
	ABANOS	75,18±*0,73*	12,78±*0,05*	7,40±*0,14*
	RONIX	76,85±0,78	9,66±0,04	10,01±0,17
G2V2	DEEA	75,81±*1,04*	11,36±*0,06*	7,71±*0,20*
	ABANOS	81,95±*0,36*	15,39±*0,03*	9,11±*0,13*
	RONIX	80,88±0,70	11,44±0,04	9,32±0,16
G2V3	DEEA	70,54±*0,85*	11,40±*0,07*	7,12±*0,21*
	ABANOS	77,46±*0,73*	14,52±*0,04*	8,52±*0,14*
	RONIX	78,50±0,79	10,71±0,05	8,34±0,17

It has been showed that biostimulators treatments improve roots growth (Liu and Cooper, 2000). In our experiments furostanol glycoside acted like biostimulators increasing roots number in all of the three cultivars, by 10-30% at Deea and Abanos and by 10% at Ronix (tab 1).

Comparing with RADI-STIM variants, the results showed that glycoside treatment leaded to an increasing of roots number 13-15% at G1 and 20-25% at G2 treated ones.

It was showed that the intensity of rooting is determined by the type and concentration of thegrowth stimulators (Novickiene et al., 2004). In our experiments glycoside concentration influenced the roots number, the results showing that in V2 concentration (0.3mM) values of roots number/cutting were 10-15% higher than those recorded at V1 (3mM) and V3 (0.03mM).

Root length is an important indicator for a potential uptake of water and nutrients. Irrespective of the chemical used, treated variants recorded higher values then untreated ones (tab. 1).

In all of the three cultivars G1 and G2 treatment induced formation of by 10-20% longer roots than RADI-STIM treatment, especially when the concentration was 0.3mM.

Biostimulators can influence shoots lengthby stimulation or inhibition of cells division andelongation. Our experiments showed a decreasing in shoots length in G1 treatment, while in G2 treated variants shoots length was close to control. (tab. 2).

Table 2

Influence of furostanol glycoside treatment on vegetative growth (Mean±SE; n = 10)

Treatment variant	Cultivar	Shoots mean length (cm)	Mean number of leaves/plant	Mean leaf area
Untreated	DEEA	13,24±0,54	7,40±0,15	53,25±0,20
	ABANOS	14,80±0,58	7,80±0,16	47,93±0,20
	RONIX	17,30±0,60	8,60±0,14	58,45±0,53
G1 Treatment	DEEA	11,00±0,54	8,60±0,29	86,79±0,54
	ABANOS	10,28±0,80	9,10±0,25	80,11±0,47
	RONIX	13,56±0,67	11,00±0,21	85,15±0,33
G2 Treatment	DEEA	13,55±0,54	8,15±0,23	46,66±0,23
	ABANOS	15,08±0,68	8,45±0,21	40,88±0,16
	RONIX	17,65±0,42	9,30±0,13	50,22±0,18

In all of the three cultivars glycoside treatments leaded to an increasing of leaves number/plant, by 15-20%in G1 treated variants and only by 10% in G2 treated ones. This may be due to inhibition of shoot growth by G1 treatments and diversion of metabolites for bunch development thereby reducing availability of metabolites for shoot elongation (Bhat, 2011).

Leaf area was also influenced by glycoside treatments (tab. 2). In all of the three cultivars G1 treatment leaded to an increase this parameter with 40-60%, while at the variants treated with G2 the values were 10-15% lower than control, which leads us to the supposition that G2 treatments has an inhibitory effect on leaves growth.

CONCLUSIONS

1. In all of the three currants cultivars, G1 treatment induced a higher development of vegetative growth, while G2 treatments had a bigger influence on rooting process.

2. Irrespective of the cultivar, all parameters related with root system and foliar apparatus growth and development recorded similar or higher values in furostanol glycoside treated variants than those of the RADI-STIM treated ones

3. Furostanol glycosides treatments were not indispensable for root formation and growth, but their application resulted in more qualitative currants cuttings in all of the three cultivars.

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